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(54) Hand-grip Bushing Assembly for Enclosed Hollow Sections

(57) A hand-grip bushing assembly for devices having enclosed hollow sections e.g. spirit levels comprises two hand-grip bushing halves (5, 5'), which are inserted in a respective one of two mutually aligned openings (3) on opposite sides of the hollow section, and are attached to each other by means of a tongue and

groove system (9, 10, 12, 13, 14) inside the hollow section (1). The hand-grip bushing halves may be in the form of bottomless troughs, whose peripheral rim (6) abuts the outside of the wall of the hollow section, and whose side walls (8), which extend inside the hollow section, interlock to form a seal by means of a groove (9) on one half (5') of the bushing and a tongue (10) on the other half (5') of the bushing.

FIG. 1

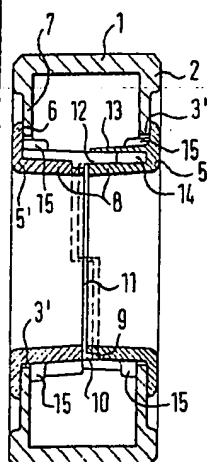
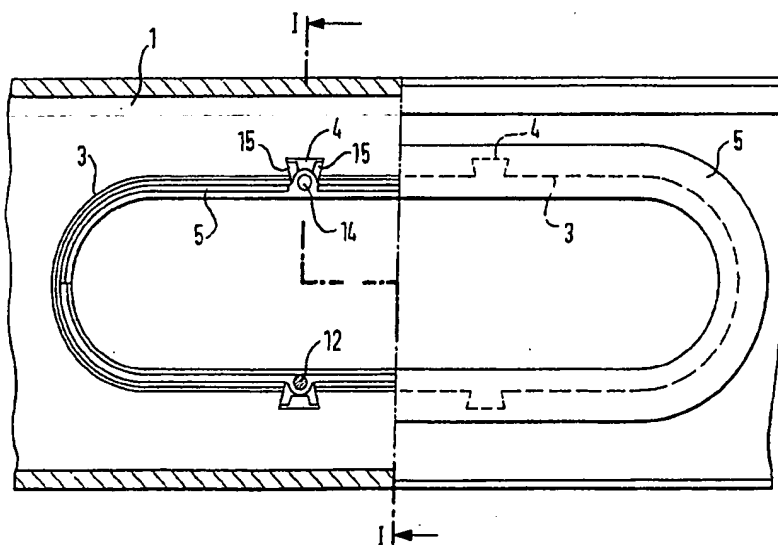


FIG. 2



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FIG. 2

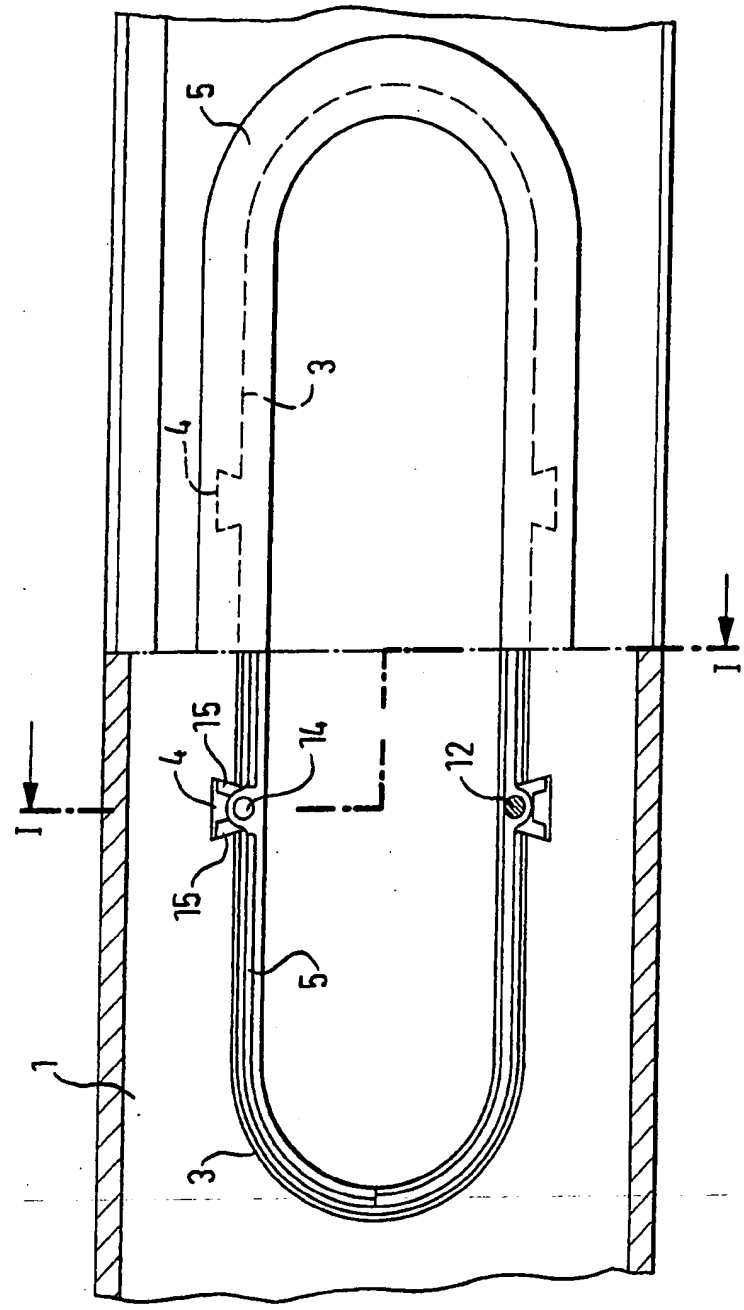


FIG. 1

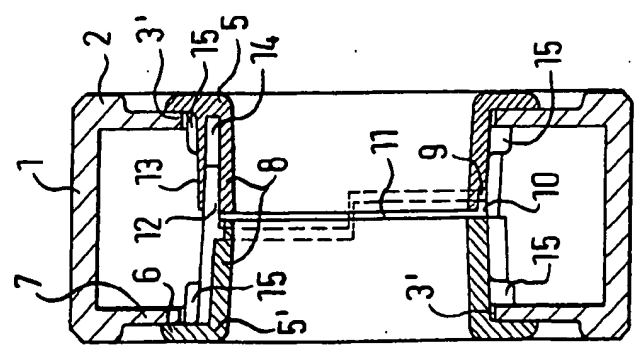
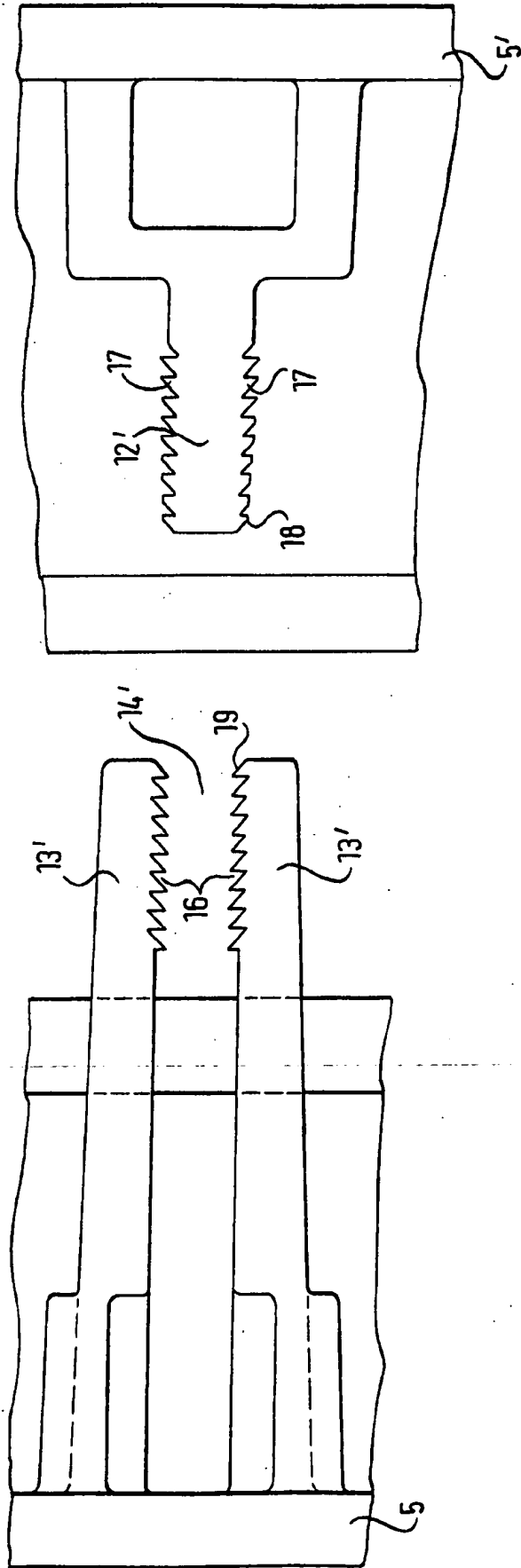


FIG. 3



SPECIFICATION Hand-Grip Bushing Assembly for Enclosed Hollow Sections

The present invention relates to a hand-grip
5 bushing assembly for enclosed hollow sections, in
particular the hollow section of a spirit level,
which assembly is inserted in openings in the
walls of the enclosed hollow section.

Spirit levels in particular, comprise an elongate
10 chassis of rectangular, I- or similar shaped
section. The actual spirit levels, i.e. bubble units,
are appropriately mounted in this chassis. The
chassis may be made of wood, cast metal
(preferably a light metal) or drawn sections.

15 Extruded, rectangular-section tubes, in the form of
enclosed light-metal hollow sections, have proved
particularly advantageous for this purpose. Such
rectangular-section tubes have the advantage of
very light weight combined with substantial
20 stiffness. In addition, they provide favourable
conditions for the rigid, secure mounting of the
bubble units, and can be manufactured to the
necessary standard of accuracy at favourable
cost.

25 The only disadvantage which these spirit-level
chassis comprising extruded rectangular-section
tubes have compared with known cast spirit-level
chassis generally in the form of a frame of I-
shaped section, whose web has a central opening,
30 is that they cannot be held by placing the hand
through them, as in the case of these latter. This,
however, is a particularly effective method of
handling in practice, since it enables the spirit
level to be held firmly in the hand without
35 hindrance to its application to the component to
be levelled.

It is also known to provide such through hand
40 grips in spirit levels made of wood, and from
rectangular-section metallic tubes, by milling out
elongate slots at suitable points in the centre of
the chassis. Since these slots are disposed in the
vicinity of the neutral zone of the section, the
spirit-level chassis are not thereby substantially
weakened.

45 When this method is used for rectangular-
section tubes, however, correspondingly sharp
edges are formed on the inner sides. Moreover,
access to the interior of the section is thereby
opened up, so that dust is able to accumulate, and
50 can only be removed with difficulty. For this
reason, according to known practice, these
through hand grips are sealed by means of hand-
grip bushings which are inserted in the milled-out
slots. Single-piece embodiments of such hand-
55 grip bushings are known, which are manufactured
from relatively resilient plastics material and can
be snapped into the slots. This method of
attachment is, of course, simple, but is by nature
insufficiently secure. Moreover, for such an
60 application it is necessary to have recourse to a
relatively soft, resilient material for manufacture
of the hand-grip bushings, in order to enable the
bushings to be correctly inserted. However, such
material has the disadvantage of undesirable

65 deformation of the bushings, and consequently
the risk of the bushings falling out of the
openings.

The aim of the present invention is therefore to
create a hand-grip bushing suitable for such
70 enclosed hollow sections, which can not only be
easily inserted, but also securely retained, in the
corresponding openings.

According to the present invention, there is
provided a hand-grip bushing assembly for
75 enclosed hollow sections, which assembly is
inserted in opposed openings in the walls of the
hollow section, said assembly comprising two
hand-grip bushing halves which, in use, are
inserted from opposite sides in a respective one of
80 two mutually aligned openings in said hollow
section, the hand-grip bushing halves
incorporating a tongue and recess system for use
in joining the hand-grip bushing halves together
inside the said hollow section.

85 The halves of the divided hand-grip bushing
can be particularly easily inserted in the openings
in the hollow section from the outside, without
the necessity to use a particularly soft material for
this purpose. The two halves are rigidly attached
90 to each other inside the hollow section, effectively
sealing the latter, in such a manner that the
bushings are reliably prevented from working
loose and falling out of the openings. At the same
time, the material may be relatively rigid. The
95 fastening elements are completely enclosed by
the enclosed hollow section, so as to render them
invisible from the outside. They fully seal the
section, and, after assembly, the hand-grip
bushings can be removed only by destroying
100 them. Preferably, the hand-grip bushing halves
overlap each other in the manner of a tongue and
groove joint inside the hollow section, so that
tight sealing of the hollow section is thereby
ensured. In addition, pins engage in
105 corresponding recesses, so that, by this additional
means, the hand-grip bushings inserted in the
hollow section can be securely and inseparably
joined together.

These fastening elements are so arranged
110 symmetrically on each half of the hand-grip
bushing that both the male and the female parts
of the fastening elements are symmetrically
distributed about one and the same half of the
bushing. This ensures that both halves of the
115 hand-grip bushing are completely identical in
shape.

In one embodiment of the present invention
the pins and sockets are of matching conical
configuration and the pins are an interference fit
120 in the sockets. This provides a firm abutment with
any section, even when the latter exhibits
substantial tolerances in width. Clamping of the
hand-grip bushing halves in the section is effected
in such a manner that deformation is substantially
125 prevented.

In order to prevent the relatively long and thin
side walls from bending inwardly under stress and
then spring out of the opening, projections are
preferably formed on the side of the side wall of

the hand-gripbushing halves which face inside the hollow section, in the region of the transition to the peripheral rim, which projections engage in correspondingly formed notches in the openings.

- 5 Preferably the projections are integrally formed with the sockets and pins and are trapezoidal in shape, the notches being of complementary dovetail shape. These features improve the interlocking of the projections and the notches.

- 10 Preferably the hollow section is provided externally with reinforcing ribs flush with the peripheral rims of the inserted hand-grip bushing halves. In order to avoid gaps between these reinforcing ribs and the peripheral rim of the hand-grip bushing halves, the latter may be formed so as directly to abut each other, so that the overall homogeneity of the device is not prejudiced.

- The present invention will now be further described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a crosssectional view along the line I—I of a spirit-level chassis provided with a hand-grip bushing assembly according to the present invention;

- 25 Fig. 2 is a side-elevational view of a spirit-level, in which, in the left-hand half, the upper hand-grip bushing is removed, and a longitudinal sectional view of the spirit-level chassis, and

- 30 Fig. 3 shows a variant of the method of fastening the hand-grip bushings.

- Figs. 1 and 2 of the accompanying drawings show the present invention as applied to a spirit-level chassis 1, in the form of an enclosed hollow section, which, in the case now under consideration, is a rectangular-section tube with a longitudinal ribs 2 extending externally along the narrow sides, one or more oval openings 3 being provided in the sides 7 of said tube. A plurality of dovetail notches 4 are arranged at certain intervals in the rims of these openings 3, 3'.

- One half 5, 5' of a hand-grip bushing according to the present invention is inserted from the outside in a respective opening 3, 3', the hand-grip bushings being each in the form of bottomless troughs—as viewed in Fig. 2. As the openings 3, 3' are effectively aligned with each other, the halves 5, 5' of the hand-grip bushing are also aligned with each other when inserted in openings 3, 3', a toroidal peripheral rim 6 of said halves 5, 5' abutting the sides 7 of the rectangular-section tube, while the side walls 8 of the hand-grip bushing halves seal access via the opening 3, 3' to the interior of the tube section.
- 55 One half of the bottom edge of the side walls 8 is provided with a groove 9, and the other half is provided with a tongue 10. On assembly, the tongue 10 of one bushing half engages in the groove 9 of the other bushing half, and thereby seals the gap 11 which is formed between the hand-grip bushing halves 5, 5' when the width of the tube section exceeds the depth of the two side walls 8 together. The depth of the side walls 8 is so selected that the latter just touch each other when the width of the section is at its

minimum limit of tolerance. The width of the gap 11 then corresponds to the actual width of the section used.

- One or more pins 12 are mounted on each half 5, 5' of the hand-grip bushing and extend from one half bushing beyond the side wall 8 of that half bushing, to engage in a bore 14 in an enlarged region 13 of the other half bushing. Preferably, each half of the hand-grip bushing is provided on one symmetrical half of the periphery of the side wall, with pins, and on the other symmetrical half of the periphery of the same side wall, with matching sockets. This simplifies manufacture, the bushing halves being then identical. The pins 12 are preferably conical in shape, and are in interference fit in the bores 14. On assembly, the pins 12 are press-fitted in the bores 14, the depth of their insertion being variable in order to match variations in the width of the tube section. They are secured in this position owing to their being in the form of known grooved pins, or to their being subjected to ultrasonic radiation on their insertion in the bore 14, whereby they are welded in the bore, or to the bores 14 being treated with a suitable adhesive substance prior to the insertion of the pins 12.

- Alternatively, it is possible to manufacture pins and bores in the form of a snap fastening. An enlarged-scale view of the fastening elements of one form of suitable snap fastening, in the disassembled state, is shown in Fig. 3. Correspondingly, the sockets 13, 14 of the above-described embodiment (Figs. 1 and 2) are in the form of at least two strip-like jaws 13', between which there is formed an elongate gap 14'. Over a limited end portion, the mutually opposed inner sides of the jaws 13' are provided with saw-tooth profiling 16. The pin 12', which forms the companion part of the fastening, is of a size corresponding to the gap 14', and is provided with corresponding saw-tooth profiling 17 over a portion of similar length.

- The saw-tooth profiling is transversely oriented, so that the pin 12' is insertable in the gap 14' in such a manner that the saw-tooth profiling 17 of the pin 12' slides in the manner of a ratchet over the saw-tooth profiling 16 of the strips 13' and, corresponding to the pitch of the saw teeth, so engages with the latter, in the manner of a detent mechanism, that it is impossible to withdraw the pin 12'. Subsequent loosening of the interconnected hand-grip bushings 5, 5' is thereby rendered impossible without destroying the hand-grip bushings themselves. The distance the pin 12' can be inserted, and locked, in the gap 14' between the strips 13' can be varied in order to match variations in the spirit-level chassis section. In order to permit the saw-tooth configurations to slide one into the other in the manner of a ratchet, the strips 13' are of flexible construction, so that they are able to move relative to each other when subjected to elastic deformation. Should the outer rim 6 of the hand-grip bushings 5, 5' abut the sides 7 of the spirit-level chassis (1) without

interlocking of the transverse faces of the saw teeth taking place, the hand-grip bushing halves can move at most one tooth pitch apart. If the pitch is correspondingly small, the distance between the rim 6 of the hand-grip bushing halves 5, 5' and the side 7 of the spirit-level chassis 1 is, practically speaking, insignificant, and equivalent to a close fit.

The saw teeth of the saw-tooth configurations 16 and 17 substantially match each other dimensionally, so that the teeth of the configuration 17 of the pin 12' are able to engage in the transverse grooves formed between the teeth of the configuration 16 of the strips 13'. The tips of the saw-teeth of the configuration 17 of the pin 12' are blunted. The degree of bluntness increases in a direction towards the free end of the pin 12'. This permits the pin 12' to be inserted in the gap 14 with less frictional

resistance, the oblique faces of the leading teeth 18 of the pin 12' forcing apart the corresponding oblique faces of the leading teeth 19 of the strips 13'. Furthermore, blunting of the teeth permits closer engagement of the saw teeth in the cavities between the saw teeth of the strips 13'.

In other respects, the fastening elements of this type are arranged on the hand-grip bushing halves in an identical manner to the fastening elements described with reference to Figures 1 and 2.

In order to prevent the relatively long and thin side walls 8 from bending inwardly under stress, and then possibly springing out of the openings 3, ribs 15 are arranged in the configuration of a V in the region of the pins 12 and the enlarged region 13. When the hand-grip bushing halves are inserted from the side, these ribs 15 engage from the inside with the sides of the dove-tail notches 4 in the spirit-level chassis, and thereby rigidly attach the side walls 8 of the hand grip bushing halves to the sides 7 of the spirit-level chassis.

Such hand-grip bushing fastenings can be fitted not only to a spirit-level chassis, but also to any articles manufactured from hollow sections which have parallel side walls, such as straightedges, smoothing boards, measuring staffs, and such like.

Claims

1. A hand-grip bushing assembly for enclosed hollow sections, which assembly is inserted in opposed openings in the walls of the hollow section, said assembly comprising two hand-grip bushing halves which, in use, are inserted from opposite sides in a respective one of two mutually aligned openings in said hollow section, the hand-grip bushing halves incorporating a tongue and recess system for use in joining the hand-grip bushing halves together inside the said hollow section.

2. A hand-grip bushing assembly as claimed in claim 1, in which the hand-grip bushing halves are each in the form of bottomless troughs, whose peripheral rim, in use, abuts the outside of the hollow section provided with the respective

opening, and whose side walls, which, in use, extend inside the hollow section, interlock to form a seal, owing to the formation of a groove on one half of the hand-grip bushing, and the formation of a tongue on the other half of the hand-grip bushing.

3. A hand-grip bushing assembly as claimed in claim 2, in which each half of the hand-grip bushing is provided on one symmetrical half of the periphery with a recess, and, adjoining it, on the other symmetrical half of the periphery, with a matching tongue.

4. A hand-grip bushing assembly as claimed in at least one of claims 1 to 3, in which on the side of the side wall of one half of the hand-grip bushing facing inside the hollow section, there are formed one or more pins, which extend in a direction towards the other half of the hand-grip bushing, and, in this direction, along the corresponding side wall, engage in sockets which are shaped to match the shape of the pins and are formed on the side of the side wall of the other half of the hand-grip bushing which faces inwardly inside the hollow section.

5. A hand-grip bushing assembly as claimed in claim 4, in which each half of the hand-grip bushing is provided on one symmetrical half of the periphery of the side wall with the pins, and on the other symmetrical half of the periphery of the same side wall with the matching sockets.

6. A hand-grip bushing assembly as claimed in claim 4 and/or 5, in which the pins and the sockets are of matching conical configuration, and the pins are an interference fit in the sockets.

7. A hand-grip bushing assembly as claimed in at least one of claims 4 to 6, in which the pins are a press fit in the sockets.

8. A hand-grip bushing assembly as claimed in at least one of claims 4 to 6, in which the pins are in the form of grooved pins.

9. A hand-grip bushing assembly as claimed in at least one of claims 4 to 6, in which the pins are ultrasonically welded in the sockets.

10. A hand-grip bushing assembly as claimed in at least one of claims 4 to 6, in which the pins are adhesively secured in the sockets.

11. A hand-grip bushing assembly as claimed in claim 4, in which the sockets comprise strips which are resiliently movable in a direction towards or away from each other, and which form between them a gap, the inner end portions of these strips being provided with a saw-tooth profile, such that the surfaces of the teeth which extend at an angle with respect to one another are so oriented transversely to the longitudinal direction of the strips that oblique surfaces, and surfaces disposed at right angles to the longitudinal direction of the strip, alternate with each other from the free end of the strips inwardly in the longitudinal direction of the strips, and the pin is provided with a corresponding sawtooth profile, whose oblique surfaces and surfaces at right angles to the longitudinal direction of the pin alternate with each other from the free end inwardly in the longitudinal direction of the pin.

12. A hand-grip bushing assembly as claimed in claim 11, in which the tips of the saw teeth of the saw-tooth profiling of the pin are blunt.

5 13. A hand-grip bushing assembly as claimed in claim 12, in which the saw teeth are increasingly blunt in a direction towards the free end of the pin.

10 14. A hand-grip bushing assembly as claimed in at least one of claims 1 to 13, in which, on the side of the side wall of the halves of the hand-grip bushing facing inwardly inside the hollow section, in the transition region leading to the peripheral rim, projections are formed, which engage in matching notches in the said openings.

15 15. A hand-grip bushing assembly as claimed in claim 14, in which the projections are integrally formed with the sockets or the pins.

20 16. A hand-grip bushing assembly as claimed in claim 14 and/or claim 15, in which the projections are trapezoidal in shape and diverge in a direction away from the side wall, and the notches are of matching dovetail, shape.

17. A hand-grip bushing assembly as claimed in claim 14 and/or 15, in which two projections
25 are provided which extend outwardly from the said side wall and are disposed in the form of a V relative to each other in order to form the shape of a trapezium.

30 18. A hand-grip bushing assembly as claimed in claim 17, in which the notches in the wider rim thereof are provided with an extension which extends between the V-formation projections.

35 19. A hand-grip bushing assembly as claimed in at least one of claims 1 to 18, in which the hollow section is provided externally with reinforcing ribs arranged flush with the peripheral rim of the inserted hand-grip bushing halves.

40 20. A hand-grip bushing assembly for enclosed hollow sections, which assembly is inserted in opposed openings in the walls of the hollow section, said assembly being constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.